

Remarks

Applicant has filed the amendments above and the Remarks below in response to the Examiner's rejection of all pending claims in the Office Action issued September 30, 2004. Applicant respectfully requests that the Examiner consider the amended claims and pass the application into allowance.

Status of the Claims

The Examiner has rejected claims 1 to 6. Claim 1 has been amended. Claims 7 and 8 have been added. Claim 5 has been cancelled without prejudice. Accordingly, presented herein for Examiner's consideration are claims 1 to 4 and 6 to 8.

The Examiner has rejected claims 1 to 3 as being anticipated by U.S. Patent No. 5,975,196 to Gaffaney et al. (the '196), and has rejected claims 4 to 6 as being obvious over the '196 patent in view of applicant's admissions of prior art.

Support for the amendments to claim 1 is found in cancelled claim 5, which contains limitations as to feature size incorporated into claim 1, and in the specification at paragraph 0024.

Support for new claim 7 is found in the specification at paragraph 0019.

Support for new claim 8 is found in the specification at paragraph 0021.

Summary of The Invention

The present invention is a method of manufacturing a heat exchanger by forming micro-textured sheet stock into heat exchanger components, for example coolant tubes and turbulator fins, such that the micro-textured surface contacts the heat transfer media used in the heat exchanger. Conventionally embossed sheet stock provides macroscopic features of a size easily visible to the naked eye and generally on the order of magnitude of the thickness of the sheet stock into which the embossed features are pressed. In contrast to conventional embossing, the micro-textured sheet stock of the present invention is of a size not easily visible to the naked eye. The micro-textured features of

the sheet used to prepare heat exchanger components according to the present invention generally exceed the RMS surface roughness of the sheet stock (approximately 0.7 micron) and are on the order of magnitude of the thickness of the boundary layer formed by coolant media on the surface of the heat exchanger (see the specification at paragraphs 0018 and 0021). Thus, sheet stock prepared according to the present invention is given a micro-textured surface comprising features of from about 1 to about 50 microns in height. Without being bound by theory, it is believed that a heat exchanger component having a micro-textured surface of the present invention provides both an increase in the heat exchange media contact area for that component surface, and aids also in disrupting any boundary layer formed by the heat transfer media in contact with that micro-textured surface (see the specification at paragraphs 0004 and 0024).

In conventionally embossed heat exchanger components, due to the size of the features, surface embossing must be avoided or removed from areas in which the component is to be joined to another component to facilitate leak-tight joints. The inventors are the first to recognize that micro-texturing provides useful increase in cooling media contact area and provides for boundary layer disruption without the concomitant difficulties, and accordingly design considerations, presented by conventionally embossed macroscopic surface features. Accordingly, the present invention method can provide improved heat exchanger components using fewer unit operations in comparison to conventional embossing techniques, and can even be used in conjunction with processes utilizing conventional embossing to provide improvements in heat exchanger components made thereby.

Summarized next is the disclosure of U.S. Patent No. 5,975,196 to Gaffaney et al. cited by the Examiner in support of the art-rejections.

Summary of U.S. Patent 5,975,196 to Gaffaney et al. (the '196 patent)

U.S. Patent No. 5,975,196 to Gaffaney et al. (the '196 patent) issued November 2, 1999 on an application filed March 6, 1996. The '196 patent discloses embossing a

pattern of ribs and notches on one side of a metal sheet, and forming and welding the sheet into a tube for incorporation into a heat exchanger (see col. 3, lines 49 to 61 therein). The embossed features taught in the '196 patent include a series of parallel ribs formed in the tube wall along the radial axis of the tube and a series of helical grooves cutting across the ribs in a spiral along the tube radial axis. The '196 patent discloses that the ribs extend from the interior wall into the interior of the tube by at least 1 % of the inner diameter of the tube, and the notches cut completely through the ribs and penetrate the tube wall by up to 30 % of the thickness of the tube wall (see the '196 patent at col. 4, lines 26 to 39).

The '196 patent does not disclose or suggest preparing a heat exchanger component from brazing sheet stock having a micro-textured surface on at least one face thereof wherein the micro-textured features are from about 1 to about 50 microns in size.

Discussion of the Examiner's Art Rejections

The Examiner has rejected claims 1 to 3 under 35 U.S.C. §102 (b) as being anticipated by the disclosure of U.S. Patent 5,975,196 to Gaffaney (the '196 patent), and rejected claims 3 to 6 under 35 U.S.C. §103 (a) as being obvious over the '196 patent in view of the ordinary level of skill in the art. In view of the amendments, reconsideration of the amended and added claims is respectfully requested.

Discussion of the Examiner's Rejection Under 35 U.S.C. §102

The pertinent parts of 35 U.S.C. § 102 state:

A person shall be entitled to a patent unless – ...

(b) the invention was patented or described in a publication in this or a foreign country or in public use or on sale in this country more than one year prior to the date of application for patent in the United States ...

To assert a finding of anticipation under paragraph (b) of 35 U.S.C. §102 the cited reference must disclose each and every element of the claimed invention, *In re Spada*

911 F.2d 705, 708, 15 U.S.P.Q. 2d (BNA) 1655, 1657 (Fed. Cir. 1990); *Schering Corporation v. Geneva Pharmaceuticals, Inc.* 339 F.3d 1373, 1377 quoting *Lewmar Marine, Inc. v. Bariant, Inc.*, 827 F.2d 744, 757 (Fed. Cir. 1987). As discussed above, the reference cited by the Examiner does not describe or suggest manufacture of a heat exchanger component from a sheet having a micro-textured surface, and in particular does not describe the preparation of a sheet having a surface texture comprising features which are 50 microns or less in size. Accordingly, the reference does not describe each and every element of the amended claims and can not support an anticipation rejection. The Examiner is therefore requested, respectfully, to withdraw the rejection of the claims into allowance.

Discussion of the Examiner's Rejection Under 35 U.S.C. § 103

The pertinent part of U.S.C. § 103 states:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains...

To establish a prima facie finding of obviousness, the prior art references cited must teach or suggest all the claim limitations (*MPEP* § 2143). It is well established in the law that obviousness can not be established by combining the teachings of the prior art to produce the claimed invention absent some teaching or suggestion or incentive to do so, *In re Richard P. Andros, Jr.*, 988 F.2d 131, 134, (Fed. Cir. 1993), 28 U.S.P.Q. 2D (BNA) 1146, citing *ACS Hospital Sys., Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577, 221 USPQ 929, 993 (Fed. Cir. 1984).

As discussed above, the '196 patent fails to disclose each and every element of the method of the present invention for manufacturing a heat exchanger component as defined in claim 1. The Examiner has cited applicant's disclosure regarding the thickness of brazing sheet used in the manufacture of heat exchanger components (a thickness of from about 25 microns to about 1500 microns) and regarding fins and turbulators being widely recognized heat exchanger components as being relevant knowledge in the art which renders the present invention, as defined in claims 4 to 6, obvious over the '196 patent. The Examiner has further concluded in the Remarks of the present action that because it is known that milled brazing sheet is typically available in thickness of from about 25 to 1500 microns it would have been obvious to provide the milled sheet with a micro-textured surface wherein the textured feature has a height ranging from about 1 to about 50 microns, since a surface feature of from 1 to 50 microns in height falls within the range of typical brazing sheet thickness (that is, from about 25 to about 1500 microns).

The Examiner has apparently confused the thickness of brazing sheet stock with its surface roughness. The two quantities are not related. As pointed out in applicant's specification, typically, milled sheet surface roughness is on the order of 0.7 microns, independent of its gage. (See for example, paragraphs 0003 and 0021). As describe above, applicants are the first to recognize that in the manufacture of heat exchanger components from sheet stock, providing sheet stock having a micro-textured surface provides increased surface area for contact between a heat transfer media and the surface of the heat exchanger component (see paragraphs 0023 and 0024). The present specification defines a micro-textured surface as the provision of surface features which increases the surface roughness above that which is typical of a mill finish (that is, texturing the surface with features of 1 micron or greater in height) and less than a typical embossed surface feature (that is, texturing the surface with features of less than about 50 microns in height). See the present specification at paragraphs 0018 and 0021.

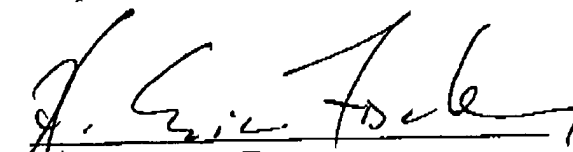
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The Examiner has not provided any reference or teaching which discloses the use of sheet stock having a micro-textured surface in the manufacture of heat exchanger components. Accordingly, the method of the present invention for manufacturing heat exchanger components and heat exchangers can not be found to be obvious in view of '196 patent alone or in combination with any disclosure regarding the prior art made in the present specification. In view of the above amendments and remarks, the Examiner is requested respectfully to withdraw the obviousness rejection.

The Examiner is requested, respectfully, to consider the amended and newly presented claims and to pass the application into allowance. The Examiner is invited to telephone applicant's undersigned attorney to discuss any outstanding issues or to suggest changes of a formal nature to place this application in better condition for allowance.

No fees are believed to be due in connection with this Reply. However, if any fees are due, the Commissioner is hereby authorized to charge any fees required to Deposit Account No. 02-2556.

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